BENEFICIATION OF WITWATERSRAND TYPE GOLD ORES BY MEANS OF OPTICAL SORTING

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ABSTRACT

Automated optical- and radiometric sorting plants treating Witwatersrand gold ore were operational in the 1970's and 80's with limited success on run of mine applications. Since then sensor based sorting technology has evolved significantly in its detection capabilities and throughput capacities of the sorting machines. Over the last 8 years some gold mines have shown renewed interest in this beneficiation technology in particular to recover misplaced reef from surface waste rock dumps.

This research comprises two case studies to prove the effectiveness and viability of optical sorting of Witwatersrand type conglomerate ores.

The first case study deals with recovering gold reef from surface rock dumps (SRD) at Kloof Gold Mine. Over a period from 2003 to 2010 various test work campaigns and pilot plant work was carried out proving both the technical and economic viability of optical sorting. Typically the grade of a SRD ranges between 0.5 g/t to 1.0 g/t of gold. Optical sorting achieved product grades of between 1g/t and 5 g/t at a mass recovery of between 5% to 30% of feed. In 2011 a 100 t/h optical sorter plant was successfully installed at the mine as part of a stand-alone process plant for treating surface rock dump material.

The second case study deals with testing waste rock sorting from run of mine ore at Central Rand Gold (CRG). The ore body can only be mined with 30% to 60% waste dilution which makes it an interesting application for coarse rock pre-beneficiation using sensor based sorting.

In both case studies the gold-bearing quartz conglomerate reef could be effectively separated from waste rock by optical sorting techniques.